

SESSIONAL EXAMINATION, JUNE 24, 1851.

MORNING—MATHEMATICS & ARITHMETIC.

1. If the two sides of a right angled triangle are respectively 30 feet and 60 feet; What is the length of the third side?

2. If the radius of a circle be 60 feet, what are its circumference and area; and show how you obtain the value of $\pi=3.14159$?

3. What is remarkable about the regular hexagon inscribed in a circle? And how has the sexagesimal division of the circle been obtained from this relation, also point out the advantages of the decimal division, and convert 6° , $3'$, $3''$ into decimal seconds?

4. What is the difference between $.25$ and $\frac{1}{3}$, and express $.111$ as a vulgar fraction?

5. Extract the square root of 9876.543 and the 7th root of the same by logarithms.

6. Given one side of a triangle = 60 feet and two angles respectively 45° and 75° to find the other sides and angles? And also the area?

7. If in a triangle two sides are given, 50 feet and 100 feet respectively and the included angle 30° , what is the 3rd side and the other angles? And the area?

8. The sides of a triangle are respectively 36, 48, and 60 feet, find the angles and area?

9. Prove Ptolemy's theorem, and deduce from it the following relation, expressed in Trigonometrical language.

When η and ϵ represent any two arcs, and r the radius

$$r \cdot \text{Sine} (\eta \pm \epsilon) = \text{Sine } \eta \cdot \text{Cos } \epsilon \pm \text{Cos } \eta \cdot \text{Sine } \epsilon$$

and from this prove that in trigonometrical language

$$r \text{Sine } \eta = 2 \text{Sine } \frac{1}{2} \eta \cdot \text{Cos } \frac{1}{2} \eta;$$

show also how this is used in finding the rule or formula for the area of a triangle in terms of the sides.

10. Solve the equation $2x + \frac{1}{2}x + 3 - 5x = 1 - 2x$.

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EVENING.—SURVEYING & ENGINEERING.

1. Point out the optical and mathematical principles and the mechanical contrivances by which the Sextant is suited to measure angles; and prove that it can indicate correctly the magnitude of any angle less than 120° .

2. What is the height of a tower, the angle of whose elevation is 45° at a distance of 1.3 chains?

3. How many square miles are in the area of a triangular Estate, whose sides are 30 miles, 60 miles, and 36 miles respectively.

4. How does the water act in Irrigation, and state the principles and rules for irrigation, as well as the most suitable soils for water meadows?

5. Write down detailed instructions for Draining a 50 acre Field, including size of main drain, &c., the fall of which may be made 8 feet in a mile.

6. What difference would you be called on to make in order to secure the same results, if the fall was only 4 feet per mile?

7. How much cutting would you require in order to remove a hill 1 mile long on an ordinary road, whose slope in either direction you find 400 feet in a mile, so as to leave it 1 in 20.

8. Describe all the instruments employed and the processes gone through in the collection of the following notes; reduce them and plot the section by writing figures for height and distances, (or to a scale of 3 chains to an inch horizontal and 20 feet to an inch vertical;) also, write down the elevation of one end of the section above the other;

Back Staff. feet.	Fore Staff. feet.	Distance in links.	
3.56	2.25	0	On B. M.
		300	R.A.C.
4.26	5.38	500	Avenue
6.83	5.32	700	gate-post.
3.66	17.44	1000	Farm
			Buildings

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